REMARKS

The Office Action mailed October 10, 2008 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1, 4-11, 13-17, 19, and 21-24 are now pending in this application. Claims 1, 13, and 19 have been amended and claims 21-24 have been added. No new matter is added.

The rejection of Claims 1, 4-11 and 19 under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter is respectfully traversed.

Applicants have amended independent Claim 1 to recite "scanning a patient's heart using an imaging scanner to generate a multi-phase axial cardiac dataset and transferring the multi-phase axial cardiac dataset to a computer." Accordingly, Applicants submits that Claim 1, as amended, satisfies the requirements of 35 U.S.C. § 101.

Claims 4-11 depend, directly or indirectly, from independent Claim 1. Applicants submit that Claims 4-11 likewise satisfy the requirements of 35 U.S.C. § 101.

Applicants have amended independent Claim 19 to recite "a combination comprising a computer and a computer readable medium." Accordingly, Applicants submit that Claim 19, as amended, satisfies the requirements of 35 U.S.C. § 101.

For at least the reasons set forth above, Applicants respectfully request that the 35 U.S.C. § 101 rejection of Claims 1, 4-11, and 19 be withdrawn.

The rejection of Claims 1, 4-8, 10, 11, 13-17, and 19 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,680,471 to Kanebako et al. (hereinafter referred to as "Kanebako") in view of U.S. Pat. No. 5,421,331 to Devito (hereinafter referred to as "Devito") is respectfully traversed.

Kanebako describes an X-ray diagnosing apparatus including, as illustrated in Figure 1, an X-ray tube 1, a detector 2, a data processing system 3, an image display device 4, an input unit 5, and an analyzer 6. The X-ray tube 1 radiates X-rays onto an object P, such as a patient. The detector 2 detects the X-rays transmitted through the object P and converts the transmitted X-rays into an image signal. The data processing system 3 has an outline extractor 3c, i.e., a computer.

The analyzer 6 receives the extracted data from the outline extractor 3c and performs functional analysis of the left ventricle of the heart, such as, ejection fraction measurement based on the volume of the ventricle at the end of diastole and the volume of the ventricle at the end of systole, and a cardiac wall motion analysis.

The outline extractor 3c sets a long axis LA of the heart. The long axis LA is set by designating two points, i.e., the middle point of the aortic valve and the apex portion of the heart shown in Figure 3C, or three points, i.e., two end points of the aortic valve and the apex portion of the heart, upon moving the cursor on the screen of the image display device 4 by using a mouse, a track ball, or the like (not shown). For example, the long axis LA is set by connecting the middle point of the aortic valve to the apex portion of the heart via a line.

As shown in Figure 4, long axis profiles are generated by drawing a large number of perpendicular lines VS with respect to the long axis LA at almost equal intervals, and obtaining the pixel values on the respective perpendicular lines VS. As shown in Figure 5, after the long axis perpendicular profiles are generated, outline points OLP of the left ventricle are sequentially determined, from the apex point of the heart to the middle point of the aortic valve, on the long axis perpendicular profiles, thereby extracting an outline OL.

A threshold value for detecting an outline point OLP is determined. As shown in Figure 6B, the threshold value is obtained by the weighted mean of the inner densities and the densities of the background area. When outline point extraction with respect to all the long axis perpendicular profile is completed, the outline points of the adjacent profiles are connected to each other, and the resultant outline data is output as a left ventricle outline.

Notably, Kanebako does not describe nor suggest calculating an axis of inertia of the segmented left cavity volume image. Rather, Kanebako describes a method of establishing a long axis and then, based on the long axis, outlining the left ventricle of the heart.

Devito describes an apparatus for automatically identifying a long axis 12 of a left ventricle of a patient's heart 4 from SPECT data acquired during a nuclear medicine study (see Figures 1 and 2). The apparatus includes a computer 8 for automatically reconstructing and automatically selecting, from the SPECT data, a single slice of the left ventricle, wherein the single slice is assumed to be a representative transverse slice of the left ventricle. The computer 8 automatically defines a reorientation axis that passes through a center of the

single slice and is intersected by the long axis 12 of the left ventricle. The computer 8 automatically reconstructs, from the SPECT data and along the reorientation axis, a sagittal slice of the left ventricle.

The computer 8 also automatically defines an axis which passes through a center of the sagittal slice. Such a determined axis is the long axis 12 of the left ventricle. As illustrated in Figures 6-10, the reorientation axis and the axis are defined using local maxima 42, which delineate the left ventricular myocardium 40.

Notably, Devito does not describe nor suggest calculating an axis of inertia of the segmented left cavity volume image. Rather, Devito describes a method of calculating the long axis from an un-segmented image of the left ventricle. The Office opines that the first estimate of the long axis of Devito corresponds to the claims axis of inertia. However, the claims axis of the inertia is calculated based on a segmented image. To the contrary, the first estimate of the long axis of Devito is calculated by drawing a line parallel to the centerline of the left ventricular myocardium (see col. 4, line 66 through col. 5, line 2), which requires an un-segmented image.

Claim 1 recites a method for generating views of a heart comprising, in part, a left cavity volume image of the heart is segmented from the multi-phase axial cardiac dataset and an axis of inertia of the segmented left cavity volume image is calculated.

Neither Kanebako nor Devito, considered alone or in combination, describes or suggests a method as is recited in Claim 1. More specifically, neither Kanebako nor Devito, considered alone or in combination, describes or suggests a method including calculating an axis of inertia of a segmented left cavity volume image.

Accordingly, Applicants submit that Claim 1 is patentable over Kanebako in view of Devito.

Claims 4-11, 21, and 22 depend from independent Claim 1. When the recitations of Claims 4-11, 21, and 22 are considered in combination with the recitations of Claim 1, Applicants submit that Claims 4-11, 21, and 22 likewise are patentable over Kanebako in view of Devito.

Claim 13 recites a medical imaging apparatus for generating views of a heart along anatomically useful planes a workstation is configured, in part, to segment a left cavity volume image of the heart from the multi-phase axial cardiac dataset and calculate an axis of inertia of the segmented left cavity volume image. Neither Kanebako nor Devito, considered alone or in combination, describes or suggests a medical imaging apparatus having a workstation configured as is recited in Claim 13. Rather, Kanebako describes a method of establishing a long axis and then, based on the long axis, outlining the left ventricle of the heart, and Devito describes a method of calculating the long axis from an un-segmented image of the left ventricle. Thus, both Kanebako and Devito describe calculating the long axis of the left ventricle from an un-segmented image thereof. According, neither describes calculating an axis of inertia of the segmented left cavity volume image.

Accordingly, Applicants submit that Claim 13 is patentable over Kanebako in view of Devito.

Claims 14-17 and 23 depend from independent Claim 13. When the recitations of Claims 14-17 and 23 are considered in combination with the recitations of Claim 13, Applicants submit that Claims 14-17 and 23 are likewise patentable over Kanebako in view of Devito.

Claim 19 recites a combination comprising a computer and a computer readable medium wherein the medium is encoded with a program configured, in part, to instruct the computer to segment a left cavity volume image of the heart from the multi-phase axial cardiac dataset and calculate an axis of inertia of the segmented left cavity volume image. Neither Kanebako nor Devito, considered alone or in combination, describes or suggests a combination comprising a computer and a computer readable medium as is recited in Claim 19. Rather, Kanebako describes a method of establishing a long axis and then, based on the long axis, outlining the left ventricle of the heart, and Devito describes a method of calculating the long axis from an un-segmented image of the left ventricle. Thus, both Kanebako and Devito describe calculating the long axis of the left ventricle from an un-segmented image thereof. According, neither describes calculating an axis of inertia of the segmented left cavity volume image.

Accordingly, Applicants submit that Claim 19 is patentable over Kanebako in view of Devito.

Claim 24 depends from independent Claim 19. When the recitations of Claim 24 are considered in combination with the recitations of Claim 24, Applicants submit that Claim 19 likewise is patentable over Kanebako in view of Devito.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 1, 4-8, 10, 11, 13-17, and 19 be withdrawn.

The rejection of Claims 1 and 6-9 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,435,310 to Sheehan ("Sheehan) in view of Devito is respectfully traversed.

Sheehan describes, as illustrated in Figure 1, a cardiac imaging and model processing system 30 having a CPU 32, image processor 40, and an imaging device 42. The imaging device 42 can be used to scan a patient's heart 44, such as the left ventricle 46 of the heart. The imaging device 42 produces a plurality of images along planes 54a through 54f as seen in Figures 2A and 2B. Each image plane represents a cross-sectional scan of the left ventricle 46. Figure 3 of Sheehan shows a scan made along a long axis of the left ventricle 46 and Figure 5 of Sheehan shows a scan made along a short axis of the left ventricle. As seen, the left ventricle 46 includes an outer surface 62, an inner surface 64, and an aorta 68.

The images showing an end diastole and/or an end systole are selected and the endocardial and epicardial borders of the left venticle are manually traced by an operator or determined by software running on the CPU 32 for each image. The data obtained by tracing the images are used to construct a model having an epicardial surface and an endocardial surface at end diastole and/or at end systole, for use in determining wall thickening. In addition, a model of the endocardial surface at end diastole and end systole, representing the location of the endocardial surface at the two extreme chamber volume conditions during a cardiac cycle is created using the data developed for each image plane at the end diastole and end systole times during the cardiac cycle.

Notably, Sheehan does not describe or suggest segmenting a left cavity volume image of the heart, calculating an axis of inertia, or automatically generating, based on the calculated axis of inertia, at least one of a long axis orientation image and a short axis orientation image of the heart.

Devito is described above.

Claim 1, as mentioned above, recites a method for generating views of a heart comprising, in part, a left cavity volume image of the heart is segmented from the multi-phase axial cardiac dataset and an axis of inertia of the segmented left cavity volume image is calculated.

Neither Sheehan nor Devito, considered alone or in combination, describes or suggests a method as is recited in Claim 1. More specifically, neither Sheehan nor Devito, considered alone or in combination, describes or suggests a method including calculating an axis of inertia of the segmented left cavity volume image.

Accordingly, Applicants submit that Claim 1 is patentable over Sheehan in view of Devito.

Claims 4-11, 21, and 22 depend from independent Claim 1. When the recitations of Claim 4-11, 21, and 22 are considered in combination with the recitations of Claim 1, Applicants submit that Claim 4-11, 21, and 22 likewise is patentable over Sheehan in view of Devito.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 1 and 6-9 be withdrawn.

In view of the foregoing remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully submitted,

/Patrick E. Brennan/

Patrick E. Brennan
Registration No. 56,511
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070